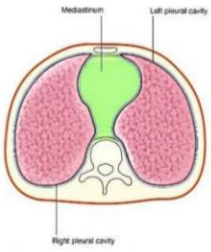
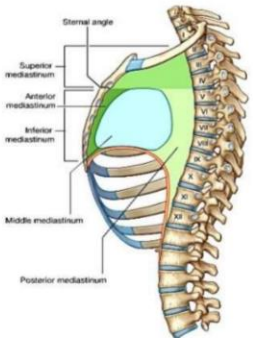
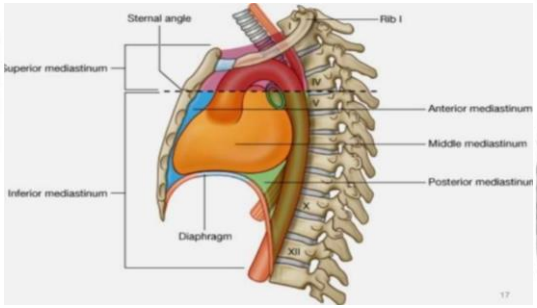
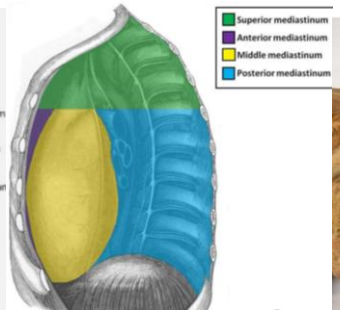
Structure	boundaries					contents
Thoracic cavity	bounded by thoracic cage					**1**. two pleural cavities (containing lungs) **2**. mediastinum
	Anterior	**Posterior**	**Superior**	**Inferior**	**laterally**	
	1. Sternum **2**. Ribs	**1**. vertebrae **2**. Ribs	extends upward into root of neck (one finger breadth above clavicle on each side)	Diaphragm	-	
Mediastinum **(region between two pleural cavities)**	Sternum	Vertebral column	Thoracic Inlet	Diaphragm	-	Subdivided into: **1**. Superior mediastinum **2**. Inferior mediastinum Divided an imaginary line from sternal angle to lower border of **4th thoracic vertebra** (T4)
Superior mediastinum	manubrium sterni	Upper 4 thoracic vertebrae T1-T4	thoracic inlet	imaginary plane	mediastinal pleura (On each side)	**1**. Arch of Aorta + branches **2**. Brachiocephalic veins and superior vena cava **3**. Thoracic duct **4**. Thymus **5**. Phernic + vagus nerves **6**. Trachea **7**. Esophagus
Anterior Mediastinum	sternum	pericardium			-	**1**. Remains of thymus gland. **2.** Superior and inferior sterno-pericardial ligaments **3**. Mediastinal branches of internal thoracic artery. **4**. lymph nodes.
Posterior mediastinum	**1**. Pericardium **2**. heart	Lower 8 thoracic vertebrae. T5-T12			Mediastinal pleura (on each side.)	**1**. Descending thoracic aorta (Artery) **2**. Azygos vein (Vein) **3**. Superior and inferior hemiazygos veins (Vein) **4**. Thoracic duct (Lymph) **5**. Posterior mediastinal lymph nodes (Lymph) **6**. Right and left vagi (Nerve) **7**. Esophagus (**Tube**)
middle mediastinum						pericardial sac which contains: **1.** heart **2.** roots of great vessels: **I.** ascending aorta **II.** pulmonary trunk **III.** SVC

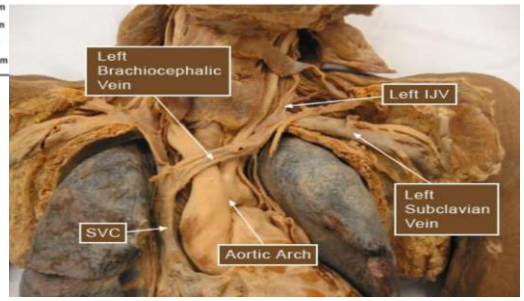
Structure	Divisions
Inferior mediastinum	1. Middle mediastinum (contains heart and pericardium)
	2. Anterior mediastinum
	3. Posterior mediastinum

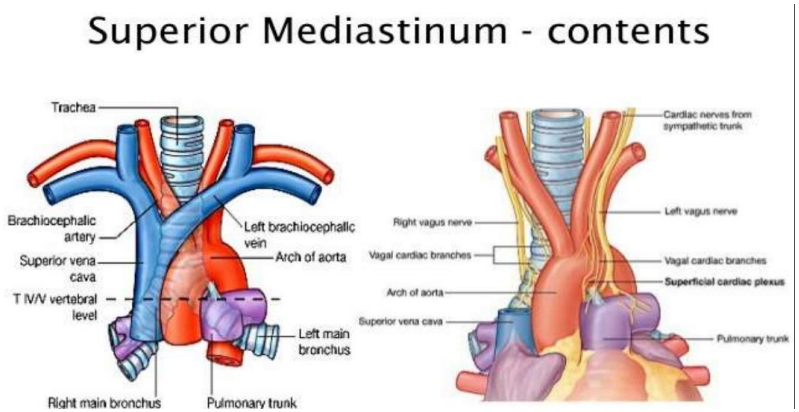


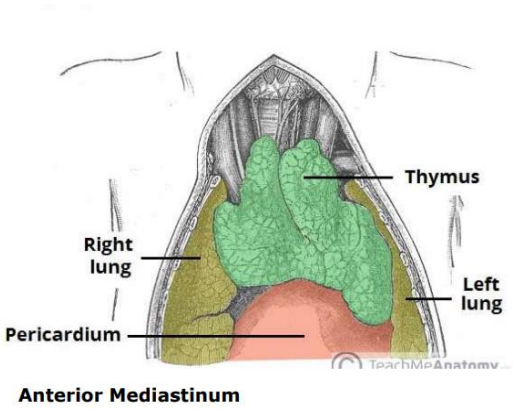


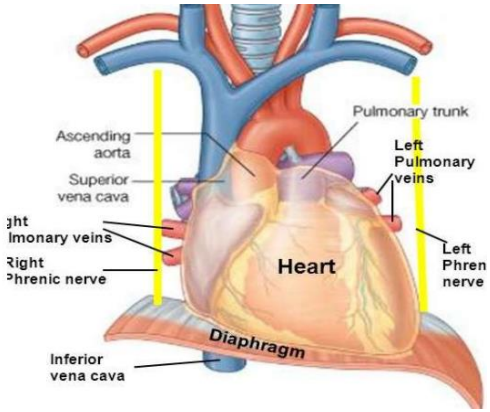




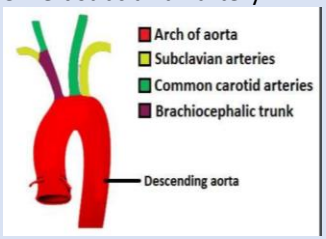
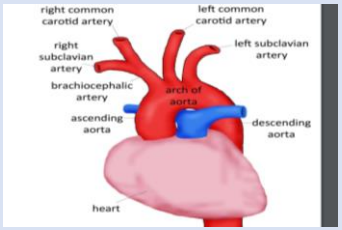
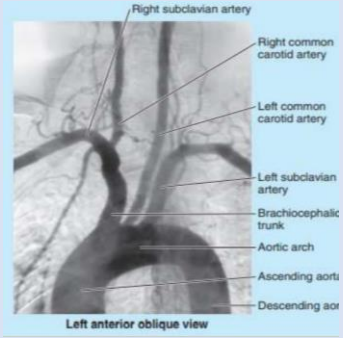




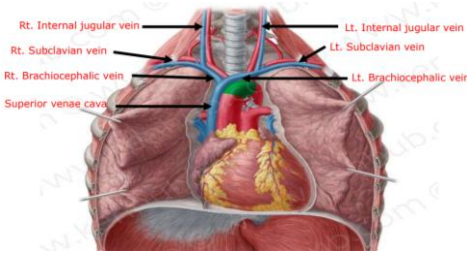


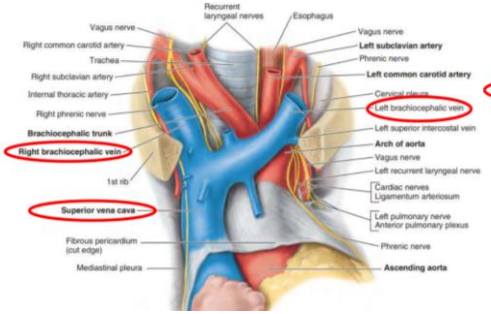


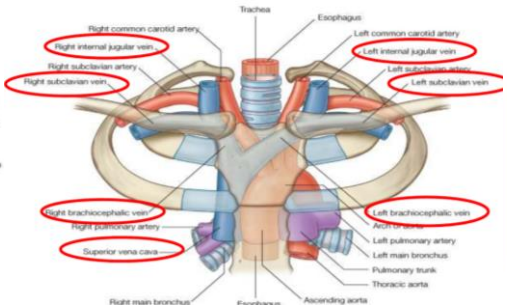
vessel	Formation	beginning	termination	pathway/course	tributaries		relations
Brachiocephalic vein (Right and left)	By union of: **1**. internal jugular **2**. subclavian veins	**Posterior** to sternoclavicular joint	1st right costal cartilage (Both right and left join forming superior venae cava)	Left longer because it passes from the left to the right side	**Right vein**	**Left vein**	Left vein **anterior** to roots of the three major branches of arch of aorta
					Right vertebral	Left vertebral	
					Inferior thyroid	Inferior thyroid	
					Right Internal thoracic	Left Internal thoracic	
					Right first posterior intercostal	Left first posterior intercostal	
						Left superior intercostal	
Superior venae cava	By union of: **1**. right Brachiocephalic vein	1st right costal cartilage	3rd right costal cartilage	receives venous return from upper half of body (above diaphragm)	-		-

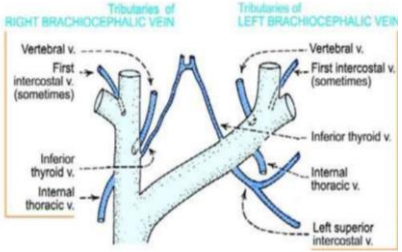
	2. left Brachiocephalic vein		(enters right atrium of heart)			
Arch of the aorta	-	Right border of sternum at **2nd right costal cartilage**	Lower border of **T4** vertebra by becoming the thoracic (descending) aorta	**1**. arches **superiorly**, **posteriorly** and **to the left**, and then **inferiorly**. **2**. The arch ascends **anterior** to the right pulmonary artery and bifurcation of trachea. **3**. passes over root of left lung to become at **left side** of trachea and esophagus	**1**. Brachiocephalic trunk **2**. Left common carotid artery **3**. Left subclavian artery   Aortic angiogram (aortogram) 	**1. Anteriorly and to the left:** **I**. left phrenic **II**. left vagus **III**. left superior intercostal vein **2. Posteriorly and to the right:** **I**. Esophagus **II**. Trachea **III**. left recurrent laryngeal nerve **IV**. thoracic duct **3. Inferiorly:** **I**. Bifurcation of pulmonary trunk **II**. Ligamentum arteriosum. (Remnant of the fetal ductus arteriosus., passes from the root of left pulmonary artery to **inferior surface** of arch of aorta) **III**. Superficial cardiac plexus **IV**. left recurrent laryngeal nerve. **V.** Left main bronchus
brachiocephalic trunk		arises **posterior** to manubrium from the aorta	At the right **sternoclavicular (SC) joint**		divides into: **1**. right common carotid artery **2**. right subclavian artery	**1**. arises **posterior** to manubrium **2**. **anterior** to trachea **3**. **posterior** to left brachiocephalic vein
left common carotid artery:		arises **posterior** to manubrium		enters neck by passing **posterior** to the **left SC joint**.		

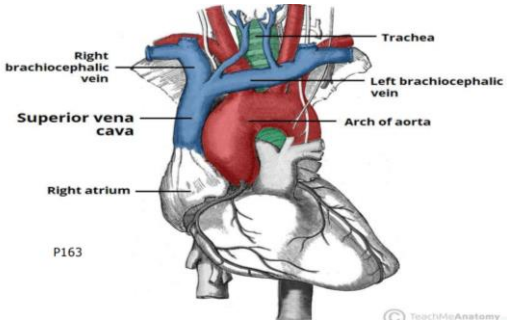
left subclavian artery		arises from **posterior** part of arch behind left common carotid artery		leaves **thorax** and enters **root of neck** by passing **posterior** to **left SC joint**.		
Descending thoracic aorta		continuation of arch on the left side of inferior border of body of **T4** vertebra	becomes abdominal aorta as it *enters abdomen* at **T12** vertebra through aortic hiatus in **diaphragm**	**1**. descends on the posterior mediastinum on the **left sides** of the **T5–T12** vertebrae **2**. lies **posterior** to root of left lung + pericardium. **3**. esophagus descends on **right side** of aorta then crosses **Infront** of it at level of **T7**.	**I. Parietal branches:** **1**. Posterior intercostal arteries from **3-11.** **2**. Subcostal artery. **3**. Superior phrenic artery. **II**. **Visceral branches:** **1**. **Two left** bronchial arteries. **2**. Esophageal branches. **3**. Pericardial branches. **4**. Mediastinal branches.	
Azygos Vein	Can form by union of: **1**. right subcostal lumbar vein **2**. right ascending lumbar vein	**1**. At union point **OR** **2**. From **back** of IVC opposite **L2** (level of renal vein)	the **back** of **SVC** **opposite** right 2nd costal cartilage.	**1**. It **ascends** through aortic opening of **diaphragm**. **2**. Then it **ascends** in posterior mediastinum till **T4** where it **arches forwards** above right bronchus	**1**.Right subcostal vein. **2**.Right ascending lumbar vein. **3**.Right posterior intercostal veins from **2-11**. **4**.Superior + inferior hemiazygos veins. **5**.**Right** bronchial veins **6**.Esophageal veins **7**.Pericardial veins **8**.Mediastinal veins	**Clinical note:** - Azygos vein is a direct link between **SVC** and **IVC**. Thus, can help in cases of **thrombosis** of **SVC** or **IVC** - The azygos vein communicates with the vertebral venous plexuses that **drain:** **1.** the back **2**. Vertebrae **3**. structures in vertebral canal.
Superior hemiazygos vein			At the level of **T7**, it **curves to the right** to end in azygos vein.	It is a longitudinal venous channel that descends on the **left side** of vertebral body	**1**. Left posterior intercostal veins from 4-8. **2**. Left bronchial veins	
Inferior hemiazygos vein	Can form by union of: **1**. left subcostal lumbar vein **2**. left ascending lumbar vein	**1**. At union point **OR** **2**. From **back** of left renal vein opposite **L2**.	At the level of **T8**, it **curves to the right** to end into azygos vein.		**1**.Left posterior intercostal veins from 9-11. **2**.Left subcostal and left ascending lumbar veins.	

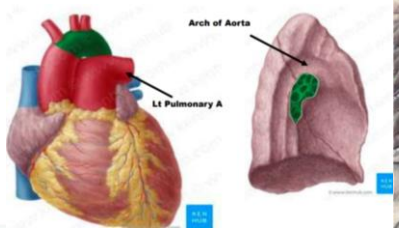

Rt. Internal jugular vein
Lt. Internal jugular vein
Rt. Subclavian vein
Lt. Subclavian vein
Rt. Brachiocephalic vein
Lt. Brachiocephalic vein
Superior venae cava


Recurrent laryngeal nerves
Esophagus
Vagus nerve
Right common carotid artery
Trachea
Right subclavian artery
Internal thoracic artery
Right phrenic nerve
Brachiocephalic trunk
Right brachiocephalic vein
1st rib
Superior vena cava
Fibrous pericardium (cut edge)
Mediastinal pleura
Vagus nerve
Left subclavian artery
Phrenic nerve
Left common carotid artery
Cervical pleura
Left brachiocephalic vein
Left superior intercostal vein
Arch of aorta
Vagus nerve
Left recurrent laryngeal nerve
Cardiac nerves
Ligamentum arteriosum
Left pulmonary nerve
Anterior pulmonary plexus
Phrenic nerve
Ascending aorta

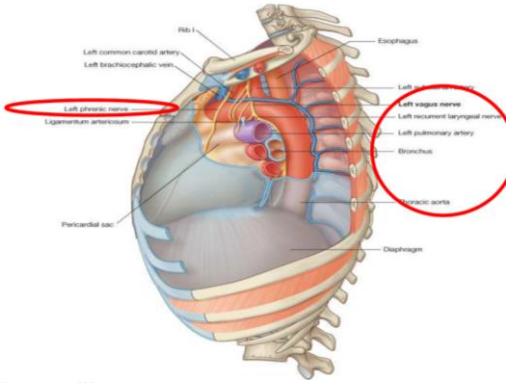

Trachea
Esophagus
Right common carotid artery
Right internal jugular vein
Right subclavian artery
Right subclavian vein
Left common carotid artery
Left internal jugular vein
Left subclavian artery
Left subclavian vein
Right brachiocephalic vein
Right pulmonary artery
Superior vena cava
Left brachiocephalic vein
Left pulmonary artery
Left main bronchus
Pulmonary trunk
Thoracic aorta
Right main bronchus
Ascending aorta

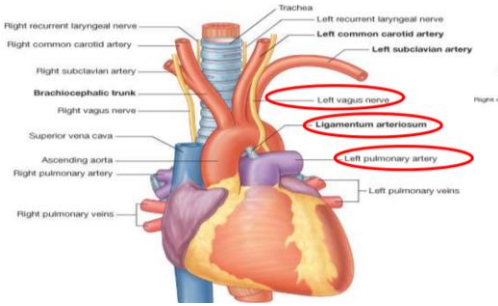

Tributaries of RIGHT BRACHIOCEPHALIC VEIN
Tributaries of LEFT BRACHIOCEPHALIC VEIN
Vertebral v.
First intercostal v. (sometimes)
Inferior thyroid v.
Internal thoracic v.
Vertebral v.
First intercostal v. (sometimes)
Inferior thyroid v.
Internal thoracic v.
Left superior intercostal v.

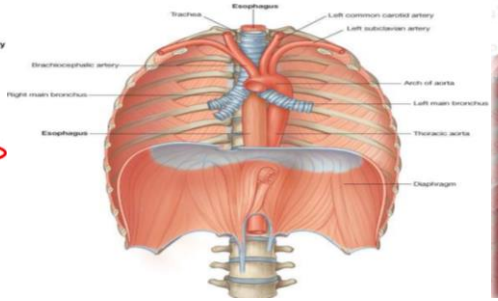

Right brachiocephalic vein
Trachea
Left brachiocephalic vein
Superior vena cava
Arch of aorta
Right atrium
P163
TeachMeAnatomy

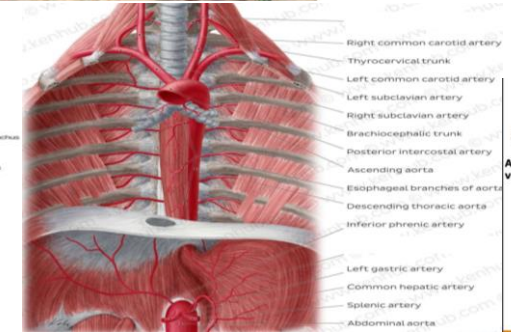

Arch of Aorta
Lt Pulmonary A

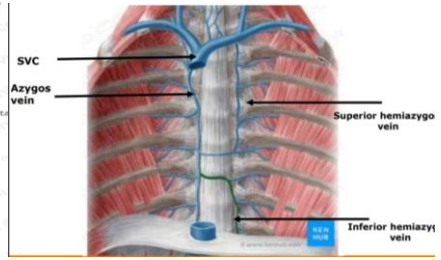

Left phrenic nerve

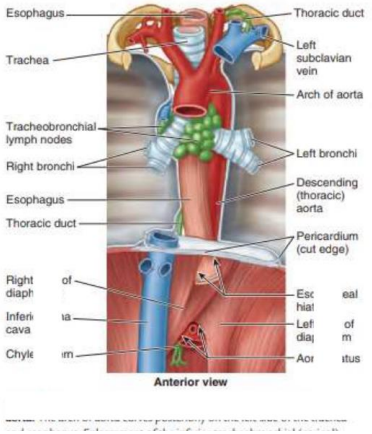

Rib I
Esophagus
Left common carotid artery
Left brachiocephalic vein
Left phrenic nerve
Ligamentum arteriosum
Left vagus nerve
Left recurrent laryngeal nerve
Left pulmonary artery
Bronchus
Pericardial sac
Thoracic aorta
Diaphragm

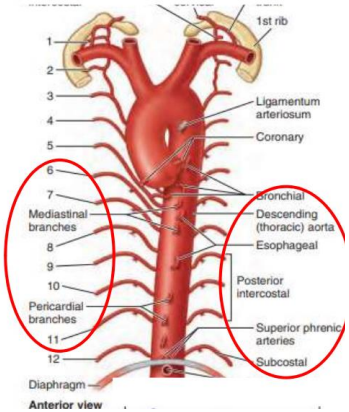

Trachea
Right recurrent laryngeal nerve
Left recurrent laryngeal nerve
Right common carotid artery
Left common carotid artery
Left subclavian artery
Right subclavian artery
Brachiocephalic trunk
Left vagus nerve
Right vagus nerve
Ligamentum arteriosum
Superior vena cava
Ascending aorta
Left pulmonary artery
Right pulmonary artery
Left pulmonary veins
Right pulmonary veins

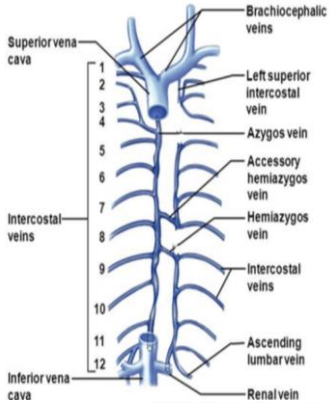

Esophagus
Trachea
Left common carotid artery
Left subclavian artery
Brachiocephalic artery
Arch of aorta
Right main bronchus
Left main bronchus
Esophagus
Thoracic aorta
Diaphragm

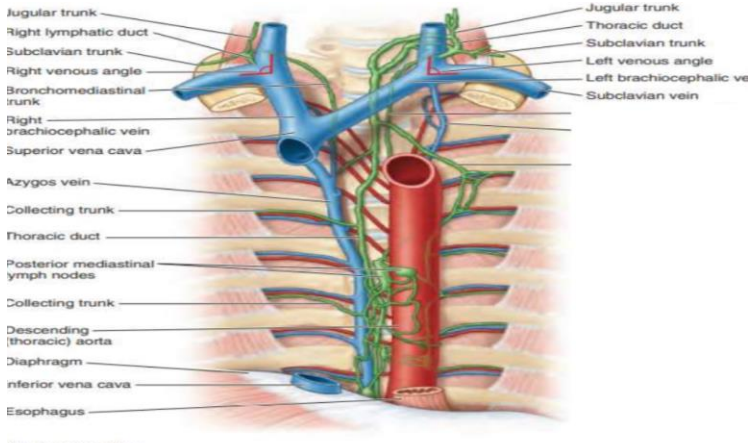

Right common carotid artery
Thyrocervical trunk
Left common carotid artery
Left subclavian artery
Right subclavian artery
Brachiocephalic trunk
Posterior intercostal artery
Ascending aorta
Esophageal branches of aorta
Descending thoracic aorta
Inferior phrenic artery
Left gastric artery
Common hepatic artery
Splenic artery
Abdominal aorta

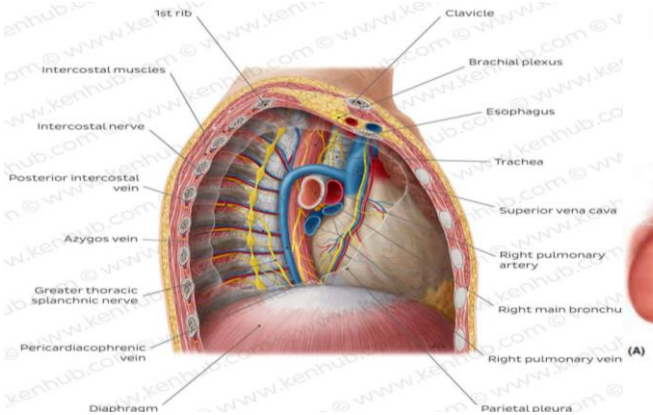

SVC
Azygos vein
Superior hemiazygo vein
Inferior hemiazyg vein

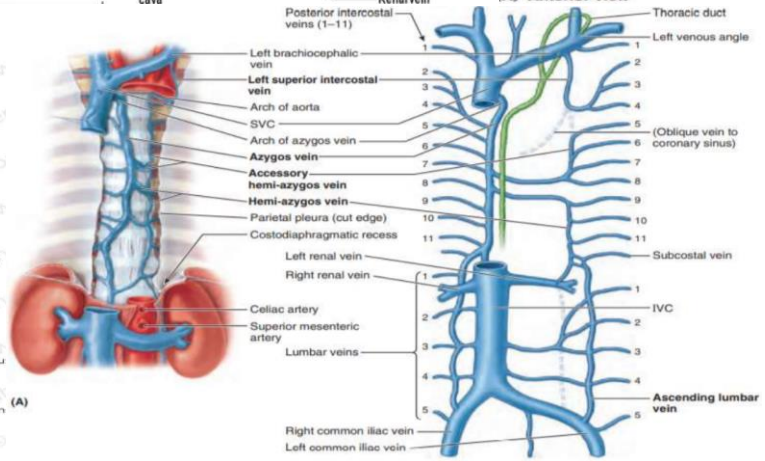






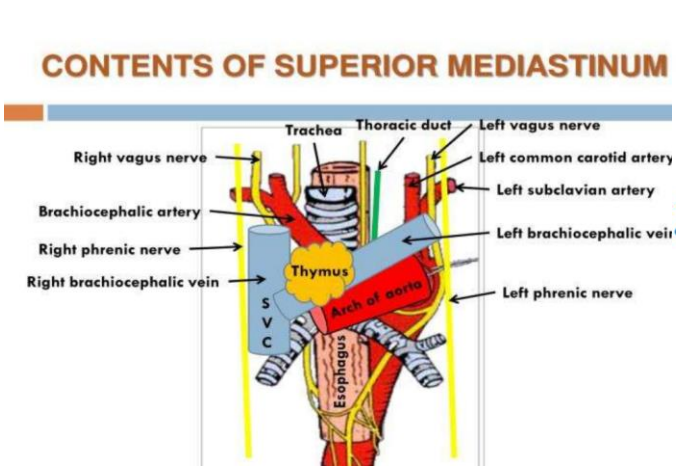


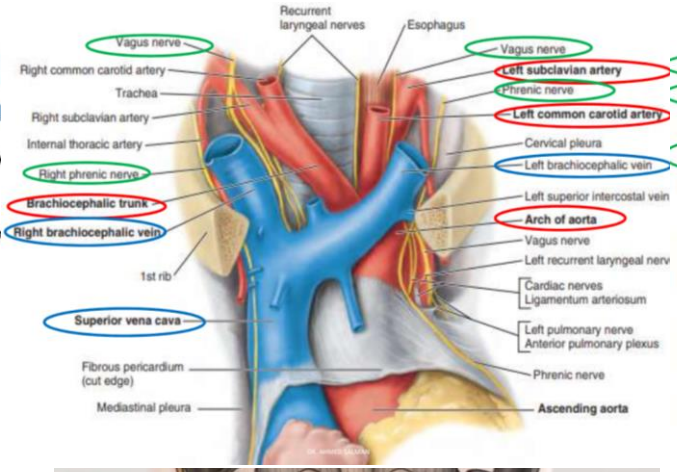


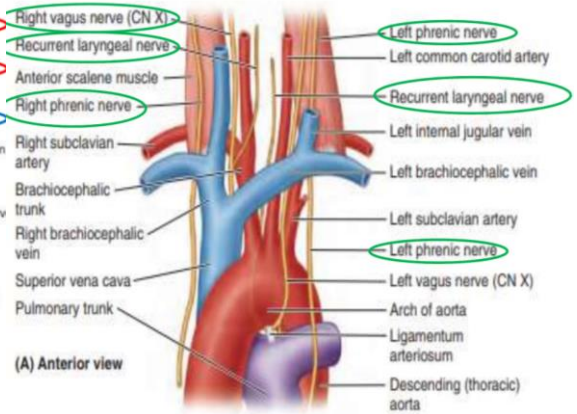


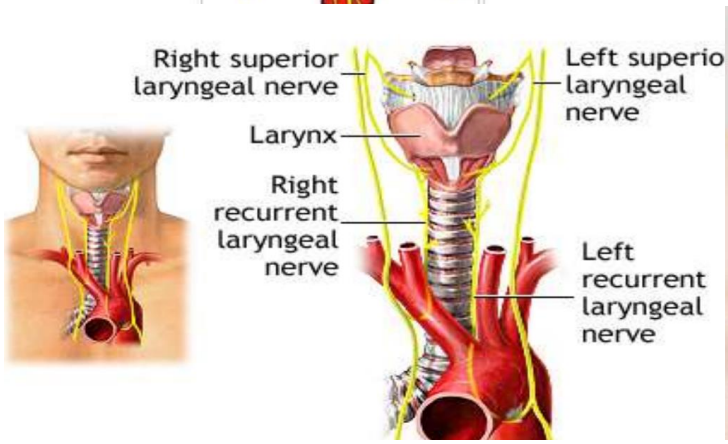
nerve	pathway	branches	notes
Left vagus	It enters **mediastinum** between left common carotid artery and left subclavian artery. (Passes **behind** root of lung)	gives left recurrent laryngeal nerve which (**hooks around** the arch of the aorta + **lateral** to the ligamentum arteriosum, and **ascends** in the **groove** between trachea and esophagus to **supply** larynx)	
Right vagus	1. Passes on **right side** of trachea 2. then **posterior** to right brachiocephalic vein + SVC (Passes **behind** root of lung)	gives right recurrent laryngeal nerve (**hooks around** right subclavian artery and **ascends** between trachea and esophagus to **supply** larynx)	**contributes** to: **1**. Rt. pulmonary plexus **2**. esophageal plexus **3**. cardiac plexus
Left phrenic	**1**. It crosses the left vagus **2**. then **runs along** the fibrous pericardium, the left atrium + ventricle of the heart. **3**. It **pierces** diaphragm to the **left** of pericardium	-	Phrenic nerves are: **1. motor** and **sensory nerve supply** for the: diaphragm

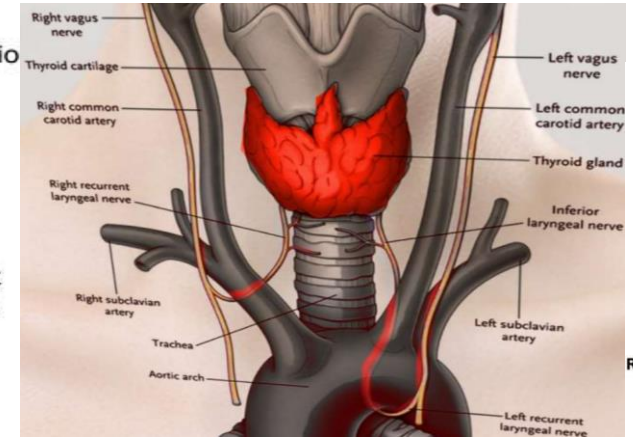
	(passes **anterior** to root of lung)		2. **sensory** to: **I**. pericardium **II**. mediastinal pleura.
Right phrenic	**1**. passes along the **right side** of: **I**. right brachiocephalic vein **II**. SVC **III**. pericardium over the right atrium **2**. descends on the **right side** of IVC **3**. pass **through** caval opening of the **diaphragm**. (passes **anterior** to root of lung)	-	

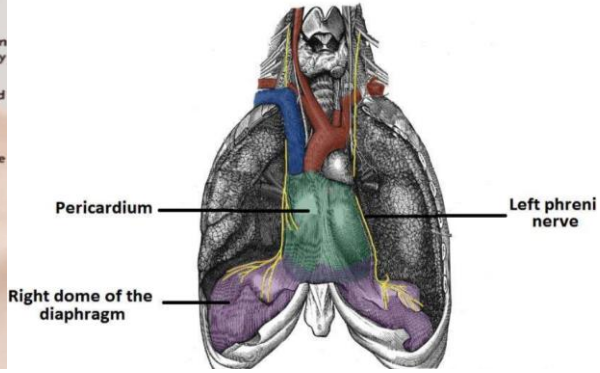






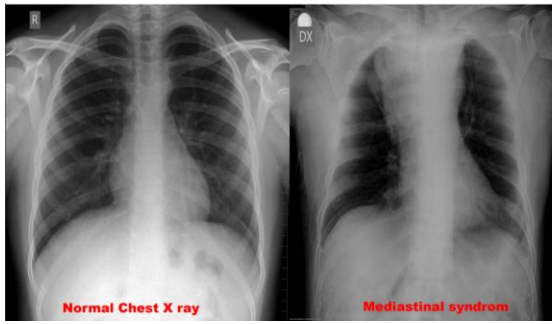






syndrome	Definition	Symptoms / Manifestations	cause
Mediastinal syndrome	group of symptoms due to **compression** of the mediastinal contents by a **space-occupying lesion**.	**1.** Dyspnea:	**compression** of trachea.
		2. Dysphagia:	**compression** of esophagus.
		3. Congestion of veins:	**compression** of SVC.

	e.g. malignant tumour as lung cancer or non-Hodgkin's lymphoma	**4**. Ischemia:	**compression** of branches of arch of aorta.
		5. Hoarseness of voice:	**compression** on left recurrent laryngeal nerve.
		6. Paralysis of hemi-diaphragm:	**compression** on phrenic nerve.
Superior vena cava syndrome (SVCS)		Dyspnea and edema in the **face** and **arms** **Pemberton sign**: Ask the patient to raise both arms **above head**, facial edema or cyanosis indicates **SVCS**	Due to **obstruction** of Superior vena cava



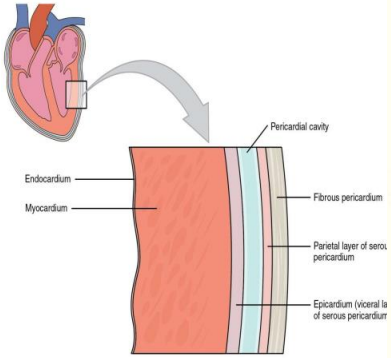
Posterior intercostal veins			
Right side		**Left side**	
number	**drainage**	**number**	**drainage**
1	Into right brachiocephalic vein	**1**	Into left brachiocephalic vein
2-3 and occasionally 4th	Into (unite) right superior intercostal vein (which drains into arch of azygos)	**2-3 and occasionally 4th**	Into (unite) left superior intercostal vein (which drains into left brachiocephalic vein)
4-11	Into azygos	**4-8**	Into superior hemiazygos
		9-11	Into inferior hemiazygos

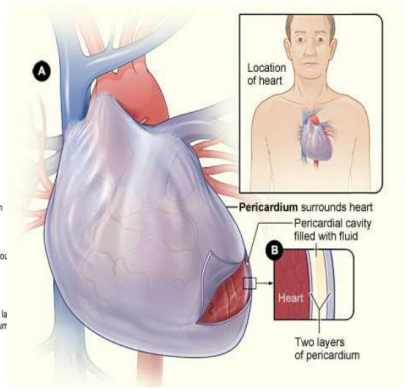
	Description	layers	Function
Pericardium	fibroserous membrane that covers: **1**. heart **2**. beginning of great vessels	**1**. outer tough layer (fibrous pericardium) **2**. inner serous layer	**1**. Restrict excessive movements of heart. **2**. Serve as lubricated container in which different parts of heart can contract.

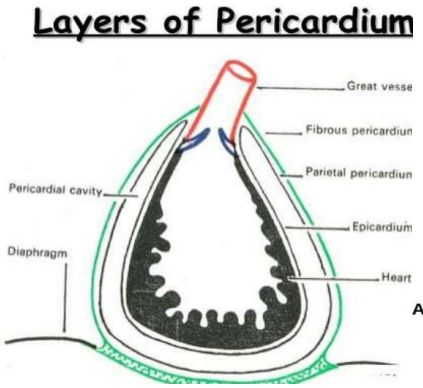
layer	attachment				Function	Description
	Superiorly	Inferiorly	Anteriorly	Posteriorly		
fibrous pericardium (outer tough layer)	Continuous with **tunica adventitia** of great vessels	Continuous with **central tendon** of **diaphragm** (**pericardiacophrenic ligament**)	Attached to **posterior surface** of **sternum** by **sternopericardial ligaments**	Bound by **loose connective tissue** to structures in the **posterior mediastinum**	**1**. heart **bonded in place** inside fibrous sac. **2**. protects heart against **sudden overfill**	**- tough conical outer sac** of pericardium. **- firmly attached** to diaphragm. **- fuses** with outer coats

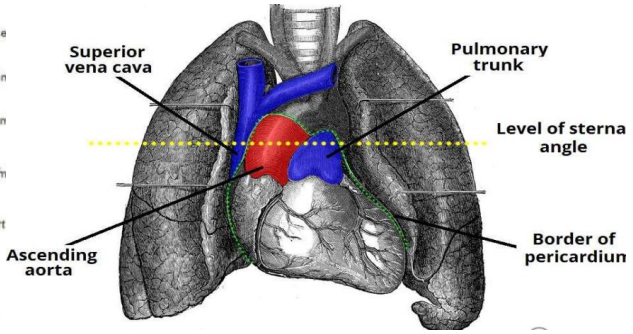
layer	Layers (2 layers + space)	Description
serous layer	**1**. parietal layer of serous pericardium	lines the **inner surface** of the fibrous pericardium

(**thin transparent double layered sac that lies within fibrous pericardium**)	**2**. Visceral layer	**reflection** of parietal layer at **great vessels**: **1**. aorta **2**. pulmonary trunk and veins **3**. superior and inferior venae cavae This layer **Adheres to heart** and forms its outer covering = epicardium (**outermost** of three layers of heart wall)
	3. Pericardial sac	**- space** between the 2 layers of serous pericardium. **-** Contains a **thin film of fluid** that acts as a lubricant for movements of the heart

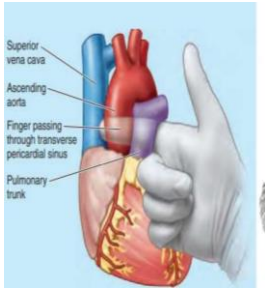


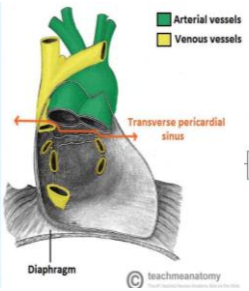


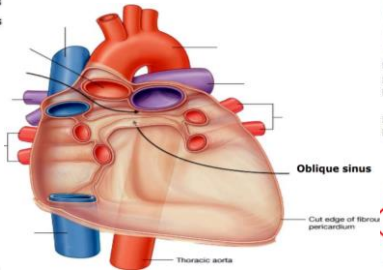


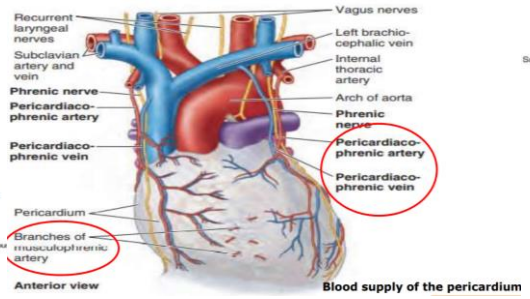


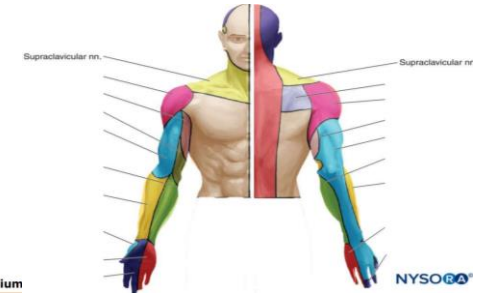
Pericardial sinuses (reflection of pericardial parietal and visceral layers)	**Anterior**	**Posterior**	**Inferior**	**Clinical importance**		
Transverse sinus	**1**. Ascending aorta **2**. pulmonary trunk	SVC	Atria of the heart	In cardiac surgery: after pericardial sac opened **anteriorly** -> finger can be passed through transverse pericardial sinus **posterior to** ascending aorta and pulmonary trunk. **1**. By passing a **surgical clamp / ligature** around these large vessels **- >** **2**. inserting tubes of **coronary bypass machine - >** **3**. tightening ligature **==>** surgeons can **stop / divert the circulation of blood** in these arteries while performing cardiac surgery i.e. coronary artery bypass grafting.		
Oblique sinus	Visceral pericardium covering **back** of **left atrium**	Parietal pericardium covering **esophagus**	Opened and **continuous** with pericardial cavity	**Superior** **Reflection** of visceral to become parietal pericardium	**Laterally** Pericardial reflection surrounding **pulmonary veins** and **IVC**	-





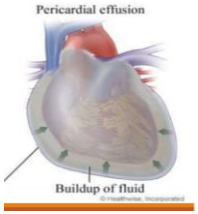


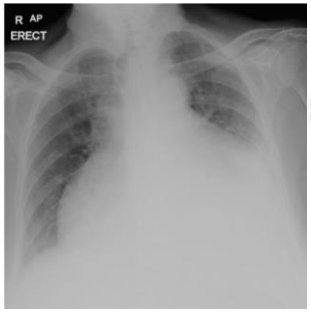




supply/drainage of the pericardium		Origin/branched from/tributary from
Arterial supply	1. **Pericardiacophrenic** artery	**slender** branch of the internal thoracic artery (main blood supply)
	2. **Musculophrenic** artery (Smaller contributions of blood)	**terminal** branch of internal thoracic artery.
	3. **Bronchial** + **esophageal** + **superior phrenic** arteries	branches of thoracic aorta
	4. **Coronary** arteries (visceral layer of serous pericardium only).	
Venous drainage	**Pericardiacophrenic** veins	tributaries of brachiocephalic (or internal thoracic) veins
Nerve supply	**Phrenic nerves** (primary source of sensory fibers) (Pericardial pain sensations is referred to skin of ipsilateral supraclavicular region, top of shoulder of same side (C3–C5 dermatomes **=>** is supplied by **supraclavicular** nerves)	(C3–C5)

Medical issue	Description / definition	Notes
Pericarditis	**inflammation** of pericardial sac which cause **chest pain**	pain usually occurs **behind** the breastbone / on **left side** of chest. The pain may: 1. **Spread** to **left shoulder** and **neck** 2. Get **worse** when **coughing**, **lying down** or **taking a deep breath** 3. Get **better** when **sitting up** or **leaning forward**
Pericardial effusion	**increase** of fluid **between** the parietal and visceral layers of the pericardium	Percrdiocentesis: pericardial effusion is usually removed by **inserting a needle** in **left** 5th/ 6th intercostal spaces close to **sternum** to avoid piercing left lung and pleura.
Cardiac tamponade	a rapid accumulation of excess fluid within the pericardial sac --> leads to **compression of heart** and **heart failure**.	





Chest X ray of Pericardial effusion